SYLLABUS

MA 3046 (4-1) Matrix Analysis

Text(s): Trefethen and Bau, **Numerical Linear Algebra**, 1st Ed.

Hours	Topics	Sections
5 - 5	Fundamentals - Introduction. Review of Vectors, Matrices, and Matrix-Vector Operations. Inner Products, Orthogonality and Norms. The Singular Value Decomposition.	Lectures 1-5, Notes
3 - 8	Practical Considerations - Floating Point Numbers and Computational Accuracy. Influences of Hardware and Software Architecture.	Notes
6 - 14	**QR** Factorization and Least Squares - Projectors. **QR** Factorization. Gram-Schmidt Methods, Householder and Givens Methods. Orthogonal Triangularization. Least Squares.	Lectures 6-11, Notes
8 - 22	Conditioning and Stability - Conditioning and Condition Numbers. Floating Point Arithmetic. Stability Considerations for Specific Algorithms.	Lectures 12-19, Notes
5 - 27	Systems of Equations - Gaussian Elimination. Pivoting Strategies and Their Effects. Stability Analysis. Cholesky Factorization.	Lectures 20-23, Notes
8 - 35	Eigenvalues - The Eigenvalue Problem. Overview of Eigenvalue Algorithms. Power Methods, Rayleigh Quotients and Inverse Iteration. **QR** Methods. Other Algorithms. Application to the SVD.	Lectures 24-31, Notes
4 - 39	Iterative Methods - Iteration. Jacobi, Gauss-Seidel and SOR. Krylov Space Methods.	Lectures 32-34, Notes
5 - 44	Exams and Holidays	

The laboratory hours will be used to study computer implementation of the theory for engineering and scientific matrix computation applications. In addition, certain aspects of the MATLAB Language will be discussed and investigated. The laboratory sessions meet in Glasgow 318 for demonstrations and hands-on experience, and to allow students to work

on assigned projects. Selected laboratory sessions may meet in other terminal rooms as appropriate.

The above schedule is suggested; actual times spent on the various topics may vary somewhat. All topics will be covered, although not every referenced page will be.

7/02
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